Patent Claims:

1. Improved process for the oxidation of organic substrates by means of $^1O_2$, characterized in that 3-90% strength H_2O_2 is added to organic substrates which are soluble in water or in organic solvents miscible with water and which react with $^1O_2$, in a water-miscible organic solvent, in water or in a mixture of water and water-miscible organic solvent in the presence of a heterogeneous or homogeneous catalyst, whereupon, following the catalytic decomposition of H_2O_2 to give water and $^1O_2$, the oxidation of the substrates to give the corresponding oxidation products takes place, where, during the reaction, water is selectively removed from the reaction mixture by means of membranes.

2. Improved process according to Claim 1, characterized in that the substrates used which react with $^1O_2$ are olefins which contain 1 to 10 C=C double bonds; C_6-C_{30} aromatics; polycyclic aromatics having 2 to 8 aromatic rings; alkyl sulfides, alkenyl sulfides, aryl sulfides which are either mono- or disubstituted on the sulfur atom, and C_4-C_{30} heterocycles with one or more O, N or S atoms in the ring, which may be unsubstituted or may be mono- or polysubstituted by halogens, cyanide, carbonyl groups, hydroxyl groups, C_1-C_{20} alkoxy groups, C_1-C_{20} alkyl groups, C_6-C_{30} aryl groups, C_2-C_{20} alkenyl groups, C_2-C_{30} alkynyl groups, carboxylic acid groups, ester groups, amide groups, amino groups, nitro groups, silyl groups, silyloxy groups, sulfone groups, sulfoxide groups or by one or more NR^1R^2 radicals in which R^1 or R^2 may be identical or different and are H; C_1-C_{20} alkyl; formyl, C_2-C_{20} acyl; C_7-C_{30} benzoyl, where R^1 and R^2 may also together form a ring.

3. Improved process according to Claim 1, characterized in that the organic water-miscible solvent used is C_1-C_8-alcohol, ethylene glycol, propylene glycol, formamide, N-methylformamide, dimethylformamide, sulfolane, dioxane, THF or 1,2-dimethoxyethane.

4. Improved process according to Claim 1, characterized in that catalysts based on molybdenum, tungsten, scandium, vanadium, titanium, zirconium, praseodymium, neodymium, samarium, europium, terbium, dysprosium, holmium, erbium, ytterbium or lutetium in the form of oxides, oxo complexes, nitrates, carboxylates, hydroxides, layered double hydroxides, carbonates, chlorides, fluorides, sulfates or tetrafluoroborates are used.

5. Improved process according to Claim 1, characterized in that 2 to 10 equivalents of H_2O_2 are used depending on the substrate used.

6. Improved process according to Claim 1, characterized in that the reaction temperature is between 0 and 50°C.

7. Improved process according to Claim 1, characterized in that organic or inorganic membranes are used for the selective removal of water.

8. Improved process according to Claim 7, characterized in that the organic membranes used for the reverse osmosis are membranes based on polyvinyl alcohol, polyamide or polysulfone or cellulose acetate, cellulose diacetate, cellulose triacetate, cellulose diacetate/cellulose triacetate, cellulose nitrate, polypropylene, polyimide, sulfonated polysulfones, polyether-

sulfones, polyacrylonitrile, polyimide/polyetherimide, polyvinylidene fluoride, aramid or polypiperazine or mixtures thereof or nanofiltration membranes based on polyvinyl alcohol, polypropylene, polysulfone, polyethersulfone, polyacrylonitrile, polyimide/polyetherimide, polyvinylidene fluoride, polyamide, polypiperazine, cellulose acetate, cellulose nitrate, aramid, cellulose diacetate, cellulose triacetate or mixtures thereof or organic pervaporation membranes based on polydimethylsiloxane, poly(1-trimethylsilyl-1-propyne), polyurethanes, polybutadiene, polyether block polyamides, silicone polycarbonates, styrene-butadiene rubber, nitrile-butadiene rubber, ethene-propene terpolymer, polyvinyl alcohol, polyamide, polysulfone, cellulose acetate, aramid, cellulose diacetate, cellulose triacetate, polypiperazine or mixtures thereof.

9. Improved process according to Claim 7, characterized in that ceramic pervaporation, zeolite or nanofiltration membranes are used.

10. Improved process according to Claim 1, characterized in that the membranes used have a retention factor for substrate and product of at least 85%.

11. Improved process according to Claim 1, characterized in that, during the reaction, water which is optionally used as solvent and water which is introduced by the 3-90% strength H_2O_2 solution and which is formed during the catalyzed disproportionation of H_2O_2 is selectively removed from the reaction mixture by pumping the reaction mixture from a reactor (1) via a pump (3) into the membrane unit (4) in which then the water is separated off through a suitable membrane, the

catalyst, in the case of a homogeneous catalyst, the still unreacted substrate and product already formed being retained and immediately reintroduced into the reactor (1) and, depending on the membrane chosen, the optionally used water-miscible organic solvent either likewise being retained, or else separated off with the water, whereupon distillative removal of the water from the organic solvent then takes place in the distillation column (5), the organic solvent is then reintroduced into the reactor (1) via the line (6), and the water which has been separated off is discarded.

12. Improved process according to Claim 1, characterized in that instead of one membrane unit (4), two membrane units are used, where the permeate of the first unit is passed to the second membrane unit, and the retentate of the first membrane unit is returned to the reactor, and then the retentate of the second unit is likewise reintroduced into the reactor, while the organic water-miscible solvent is optionally distilled off from the permeate of the second unit or, if the permeate comprises only water, it is discarded.